September 25, 2003

Vernon L. Smith. Testimony, Energy Subcommittee of House Committee on Science:

Testimony will address the following 4 questions:

1) Briefly describe the market structure for the electricity sector as it existed 15 years ago and contrast it with the structure today.

2) What barriers currently prevent wider adoption of commercially available energy technologies? What policy choices would be most conducive to greater adoption of these technologies?

3) How is uncertainly affecting the economics of investment in the electricity sector? How can we structure a market to ensure reliable electricity at the lowest cost?

4) What are the incentives for utilities to invest in transmission research and development? How can we encourage investment in research and development in a highly competitive electricity sector?

Responses:

Q1: The market structure at the retail level, which is where the system is rigid and unresponsive, has not changed in 15 years. Essentially from the neighborhood substation to the end use customer, we are talking about 1930's technology. Two slides:

Slide 1; Variability of wholesale energy cost during a hot August week in the Midwest (1980s), showing the effect of a fixed energy retail price: **Customers pay less than the cost of their energy consumed on peak, and the loss to the utility is therefore a subsidy that encourages consumption; customers pay more than the cost of their energy off peak, and are therefore taxed to discourage consumption.**

Slide 2; Effect of profit-motivated human subjects who bid their demand in to the spot market along with supply-side bids by generation firms who have market power on the shoulder demand periods. Sixteen percent of peak (20% of shoulder) demand is interruptible. **Market power is neutralized by the wholesale demand side buyers; price spikes all but disappear; and prices are much lower, more nearly reflecting the dynamic changes in wholesale costs.**

Q2: The barriers are the continuation of 85 years of regulation of the local distribution franchised monopoly preventing free entry by alternative suppliers of ENERGY. Regulation protects the right of the local distributor to tie the sale of energy into the rental of the wires.

It's like legally franchising the right of the rental car companies to require their customers to buy all their gasoline from the rental car company's own supplies. But of course the technologies required are very different in electricity.

Two suggested policies:

1. **Permit free entry by qualified energy suppliers; over time phase out energy sales by the local wires companies.**

2. Allow entrants access to the wires between the end user outlet, and the substation to install technologies that fit consumer preferences, and allow interruption of peak time energy deliveries when its cost is more than individual customers want to pay. Similarly, entrants can compete to provide customers off peak discounts.

Q3: At the retail level no one knows what menu of dynamic pricing contracts and corresponding technologies will fit individual consumer circumstances, and emerge as profitable for retail energy suppliers. Moreover, no one knows what new lower cost technologies will emerge once there is an incentive for firms to innovate between the substation and the end use consumer. **This is normal market investment uncertainty.** The structure needed to deal with that uncertainty is indicated in the two policies recommended in Q2.

Q4: The first order of business is not at the transmission level. Transmission is strained and stressed by inflexible peak consumption tending to exceed energy supplies. Transmission capacity is entirely determined by peak requirements, but at the consumption level there is neither the technology nor the competitive incentive to implement a dynamic price responsive demand that limits peak consumption, and reduces peak transmission requirements. More expensive transmission capacity could easily do more harm than good by casting in concrete the downstream rigid retail incentive demand structure.

The retail energy supply sector is not now close to being highly competitive. When it is, the supplying firms will have all the incentive they need to innovate and profit thereby.

Demand not Supply by Smith and Kiesling Demand, Not Supply

Wall Street Journal
By VERNON L. SMITH and LYNNE KIESLING

Immediately following the failure of the electrical network from Ohio to the Northeast Coast, a cascade of rhetoric swept across news networks, blaming the blackout on an antiquated grid with inadequate capacity to carry growing demand for electrical energy. As in the California energy debacle, we are hearing the familiar call on government to "do something."

The California government response -- doing something -- left the state with a staggering and unnecessary level of debt. Meanwhile, without any additional action by the state, the demand and energy supplies in California have returned to their normal and much less stressful levels and wholesale prices are back to normal. There is no news except good news, but have we gained any deep understanding of power system vulnerability and its efficient cure from this event?

Before Congress and the administration begins to follow the California model and throw other people's money at the power industry, let's have some sober and less frantic talk.

A systematic rethinking of the power demand and supply system -- not just transmissions lines -- is required to bring the energy industry into the contemporary age. Eighty-five years of regulatory efforts have focused exclusively on supply -- leaving on dusty shelves proposals to empower consumer demand, to help stabilize electric systems while creating a more flexible economic environment.

Under these regulations, a pricing system has developed that is so badly structured at the critical retail level that if it were replicated throughout the economy, we would all be as poor as the proverbial church mouse. Retail customers pay averaged rates, making their demand unresponsive to changes in supply cost. Without dynamic retail pricing, no one can determine whether, when, where or how to invest in energy infrastructure. Impulsive proposals to incentivize transmission investment, without retail demand response, puts the cart before the horse and risks expensive and unnecessary investment decisions, costly to reverse.

At the end-use customer level, the demand for energy is almost completely unresponsive to the hourly, daily and seasonal variation in the cost of getting energy from its source -- over transmission lines, through the substations and to the outlet plugs. The capacity of every component of that system is determined by the peak demand it must meet. Yet that system has been saddled with a pure fantasy regulatory requirement that every link in that system at all times be adequate to meet all demand. Moreover, the industry has been regulated by average return criteria, and average pricing.

When the inevitable occurs, as in California, and unresponsive demand exceeds supply, demand must be cut off. Your local utility sheds load by switching off entire substations -- darkening entire regions -- because the utility has no way to prioritize and price the more valuable uses of power below that relic of 1930s electronic technology. This is why people get stuck in elevators and high-value uses of power are shut off along with all the lowest priority uses of energy. It's the meat-ax approach to interrupting power flows. Between the substation and the end-use consumer appliance is a business and technology no-mans-land ripe for innovation.

When a transmission line is stressed to capacity, and its congestion cost spikes upward, the market is signaling the need for increased capacity in any of three components of the delivery system: increased investment in technologies for achieving price responsive demand at end use appliances; increased generation nearer to the consumer on the delivery end of the line; or increased investment in transmission capacity.

What is inadequately discussed, let alone motivated, is the first option -- demand response.

Many technologies are available that provide a dual benefit -- empowering consumers to control both energy costs and usage while also stabilizing the national energy system. The simplest and cheapest is a signal controlled switch installed on an electrical appliance, such as an air conditioner, coupled with a contract that pays the customer for the right to cut off the appliance for specified limited periods during peak consumption times of the day. Another relatively inexpensive option is to install a second, watt-hour meter that measures nighttime consumption, when energy usage is low, coupled with a day rate and a cheaper night rate. More costly is a time-of-use meter that measures consumption in intervals over all hours of the day, and the price is varied with delivery cost throughout the day. Finally, a load management system unit can be installed in your house or business that programs appliances on or off depending on price, according to consumer preferences.

More important, better and cheaper technologies will be invented once retail energy is subject to free entry and exit. No one knows what combination of technology, cost and consumer preferences will be selected. And that is why the process must be exposed to the trial-and-error experiment called free entry, exit and pricing. As in other industries, investors will risk their own capital -- not your tax dollars or a charge on your utility bill -- for investments that fail. Also, as in other industries with dynamically changing product demand, competition will force prices to be slashed off-peak, and increased on-peak to better utilize capacity.

Together with demand response technologies, a simple regulatory fix can give new entrants the incentive to provide customers with attractive retail demand options. Local regulated distribution utilities have always had the legally and jealously protected right to tie in the rental of the wires with the sale of the energy delivered over those wires. But these are distinctly separable activities. Just as rental car companies are separate from gas stations, electricity can be purchased separately from the company that delivers it to you -- provided only that they can access the wires to install metering, monitoring and switching devices that fit the budget/preferences of individual consumers.

Remember when Ma Bell would not let you buy any telephone but hers, and would not let you admit any licensed electrician into your house to access the telephone wires except those arriving in her service truck? All that has changed for the better in telecommunications, but we are still stuck in a noncompetitive world in the local utility industry.

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Against the backdrop of the wars in Iraq and Afghanistan, the East Coast blackout stimulated déjà vu speculation of Sept. 11 and fears of shadowy operatives bent on disaster. Since 2002, the Critical Infrastructure Protection Project at George Mason University has worked under a Department of Commerce grant to integrate the study of law, technology, policy and economics relating to the vulnerability of key U.S. infrastructure. Prime among this continuing research is investigation of the susceptibility of the national power grid.

As it turns out, terrorist speculation, though false, did not fall far from the truth. If you were to design an electrical system maximizing vulnerability to attack, it is hard to imagine a better design than what has evolved in response to regulation. If a terrorist attack took out half the energy supply to Chicago, the only viable response would be to shut down half the substations. Demand response would allow a prioritization of energy use, shutting down only the lowest priority of power consumption while supplying high value uses -- such as production facilities, computer networks, ports, airports and elevators. Power systems badly need the flexibility to selectively interrupt lowest value uses of power while continuing to serve higher value uses. Retail price responsiveness in a competitive environment provides such a priority system.

The implementation of retail demand response in the electric power industry would provide a wide range of benefits including lower capital and energy costs, fewer critical power spikes, consumer control over electricity prices, and the environmental benefits gained by empowering consumers to use electricity more wisely. Despite Milton Friedman's admonition, by adding increased flexibility to the electricity grid and sparing critical infrastructure from shutdown, demand response creates a more efficient and resilient economic structure while providing more robust security as a free lunch.

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